TIMING/SYSTEMS

INSTRUCTION MANUAL

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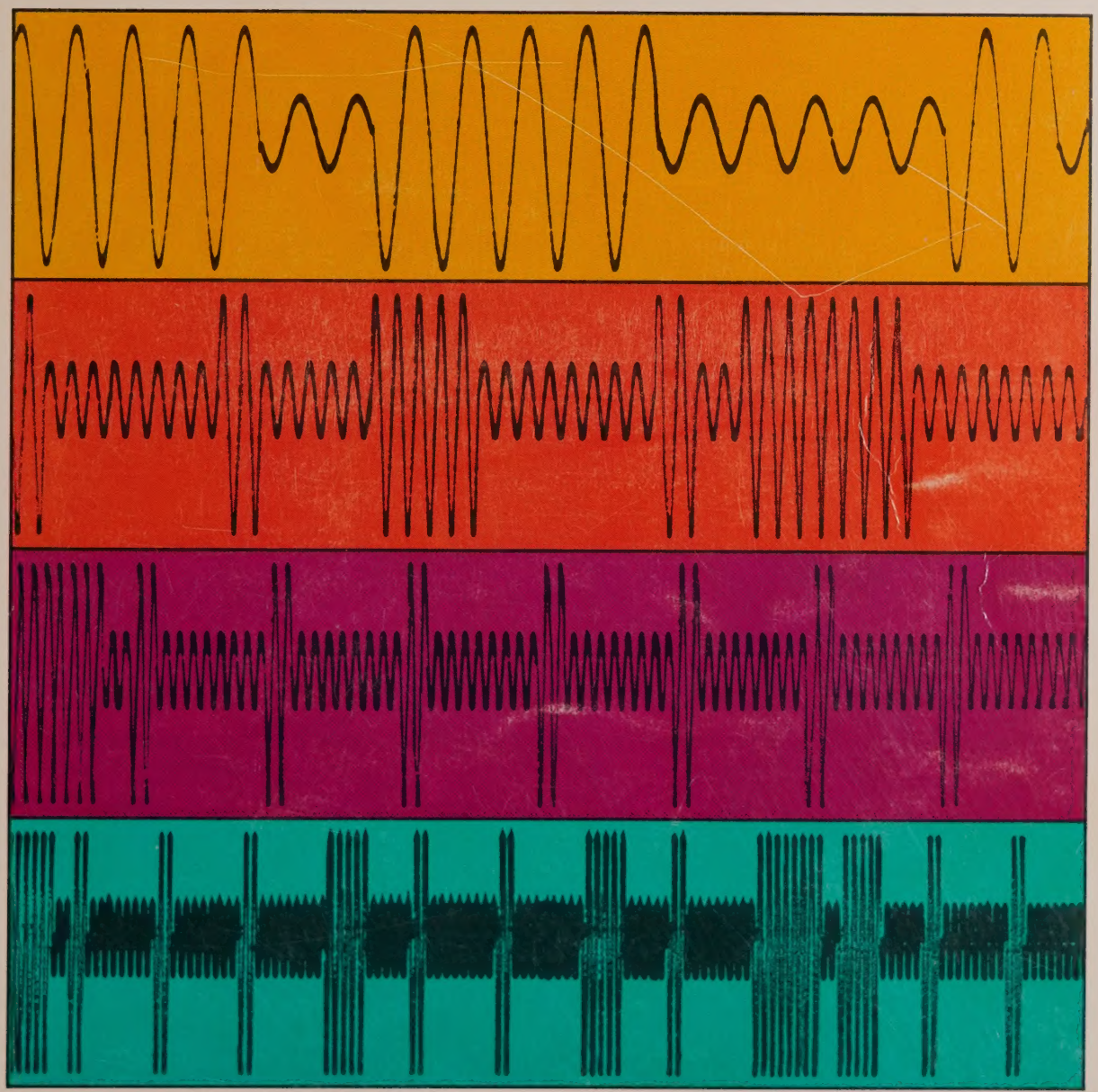
MODEL 8210

DIGITAL CLOCK



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MODEL 8210

DIGITAL CLOCK

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CHAPTER 1 GENERAL INFORMATION

1.1 INTRODUCTION

The Model 8210 Digital Clock is a low cost, versatile instrument designed for nearly any application where real or elapsed time must be maintained. The unit is lightweight and rugged, and features high reliability and low power consumption. As a precision time source it may be used for general purpose time keeping applications and, in addition, is fully compatible for use with data acquisition and logging systems.

As supplied, the clock includes a swivel mounted pedestal (tilt stand) base for bench or console mounting applications. If desired the tilt stand base may be removed (Ref. Para. 2.6) and the clock may be mounted in a rack panel for systems use (Ref. Para. 2.7).

1.2 FEATURES

The Model 8210 clock includes the following features and capability. These features are more fully described in Chapter 4. The time base reference utilizes the 60 Hz (or 50 Hz) power line frequency.

*Time of day or elapsed time is provided both visually and as BCD electrical outputs. The in-line display will accumulate either 24 hours or 100 hours before automatically resetting (see Para. 3.4). Lighted colons are provided between the hours, minutes, and seconds elements in the readout. All time information is provided as parallel BCD outputs for use with digital printers or data processing equipment. In order to prevent updating during recording cycles, the 8210 will accept an update inhibit signal which may be held for up to 800 milliseconds. Time will automatically update and resume

counting upon release of the inhibit command.

*A single front panel switch provides all operating mode control. Modes may also be remotely selected. Initial start time is presentable by means of six front panel thumbwheel switches. In addition to allowing a quick and convenient method for presetting the clock, the thumbwheels also provide a visual record of the time at which the clock was started.

1.3 CONSTRUCTION

The Model 8210 Digital Clock utilizes fully solid state construction. Monolithic integrated circuits and all silicon solid state components are used throughout. All logic circuitry is mounted on a single mother board. The time base circuitry is contained on a second board mounted on the center support together with power supply components.

The display tubes are mounted on the main logic mother board.

1.4 SPECIFICATIONS

Time Base : 60 Hz (or 50 Hz) power line frequency. (Crystal controlle oscillator optional). A standard option also allows use of an external 1 pps time base input.

Display : In-line display with full scale accumulation of 23 hours, 59 minutes, 59 seconds (99 hours, 59 min., 59 sec. by internal jumper change).

1.4 SPECIFICATIONS (continued)

Time Set : Six thumbwheel switches to select initial start time in hours, minutes, and seconds.

Electrical Outputs: (BCD lines, Pulse Rates and Optional Coincident Alarm)

Code: 8-4-2-1

Logic: Binary "0" = 0 (±0.5) volts, 15 mA sink

Binary "1" = 5 (±0.5) volts, 6 kohm source

Update Inhibit: Ground condition or 0 volts will inhibit time advance. Inhibit may be held for up to 800 msec. Open condition or +5 volts will release inhibit and clock updates normally.

Remote Control: Ground condition or 0 volts to select desired line (RESET, SET, HOLD, or RUN).

Power: 117/230 volts (±10%). Specify whether 50 Hz or 60 Hz power line frequency will be utilized. If crystal oscillator option (Option B15) is selected, unit may be operated at power line frequencies from 48 to 440 Hz.

Dimensions: 3-1/4 h x 7" w x 8-1/8"d (8.2 x 17.8 x 19.6 cm) Add 3-1/4 inches to height for tilt stand. For rack mounting, unit requires panel cutout of 3.110" h x 6.820 w (7.9 x 17.3 cm).

Environment: 0 to +50°C at up to 95% relative humidity.

Weight: 5 lbs. (2.3 kg) shipping

Accessories Furnished: Tilt stand and pedestal, 3 conductor power cord and instruction handbook furnished with each Model 8210.

1.5 OPTIONAL FEATURES

When originally ordered, the Model 8210 Digital Clock may be supplied with the following options.

OPTION A14: Provides a rear panel BNC connector and slide switch which allow internal or external time base selection of 1 pps at a nominal level of 0 to +5 volts.

OPTION A17: Provides a coincident alarm signal output. This pulse goes to zero volts for one second, and then returns to +5 (DTL Logic) and may be used to initiate logging cycles, actuate relays or control external circuitry.

OPTION B15: Provides a crystal controlled oscillator time base with an aging rate of ± 2 parts in 10^6 per month (constant temperature) operating at power line frequencies of 48 to 440 Hz instead of the 50 or 60 Hz operation.

A more complete description of these optional features is included in the text of this manual. Should the clock be supplied with special or non-standard options, an addendum will be located in the front of this manual detailing any changes.

1.6 APPLICATIONS

The Model 8210 Digital Clock is a precision time keeping instrument designed to satisfy a broad range of applications where time must

be maintained in order to provide a visual display or for recording in data acquisition or logging systems.

1.6.1 Visual Display

As a visual time display, the Model 8210 may be mounted either on a shelf or console or, by removing the pedestal, it may be panel mounted (see Para. 2.7). The two basic time keeping modes which may be utilized are time-of-day or elapsed time.

1.6.2 System Clock

In addition to the visual time display, the Model 8210 is designed for integration into data systems. Updated time is available as twenty lines of BCD information for direct connection to a recording device or a data buffer.

The Model 8210 will also accept an external command which will inhibit updating during the period when time is being recorded. This inhibit will insure that the clock does not attempt to update during the recording cycle. The update inhibit may be held for up to 800 milliseconds.

CHAPTER 2 INSTALLATION

2.1 INITIAL INSPECTION

As soon as the instrument is received, verify that it is intact and as ordered. Inspect the instrument for any damage and if shipping damage is found, refer to the warranty inside the rear cover of this manual, and to sub-section 2.2 for repackaging and shipping instructions.

As soon as possible, the instrument should be installed and given a thorough electrical inspection. The test given in the routine maintenance paragraph 4.2 is recommended for this purpose. Should the instrument fail to operate properly or fail to meet specifications outlined in Chapter 1 immediately contact your Systron-Donner representative.

2.2 STORAGE AND RESHIPMENT

Environmental conditions during storage and shipment should be limited as follows:

Maximum Temperature: 185°F (85°C)

Minimum Temperature: -69°F (-55°C)

To protect your instrument during shipment and storage, use the best packaging methods available. Your Systron-Donner field office can provide materials similar to those used for original factory packaging. Contract packaging companies can provide dependable packaging on short notice.

General packaging instructions:

(1) Wrap the instrument in heavy paper or plastic before placing it in the shipping container.

(2) If possible, use the original container designed for the instrument. Otherwise, use a strong carton (350 lb./sq. in. bursting strength) or a wooden box to house the instrument.

(3) Use plenty of packaging material around all sides of the instrument and protect the front panel with cardboard strips.

(4) Seal the package with strong tape or metal bands. Mark with "Delicate Instrument".

(5) Refer to the warranty inside the rear cover of this manual and check with your Systron-Donner field office for shipping instructions. All correspondence should refer to the instrument by model number and full serial number.

2.3 POWER REQUIREMENTS

This instrument is equipped with a standard three conductor power cord that automatically grounds the instrument when a matching power receptacle is available. An adapter which provides an instrument ground should be used whenever the power cord must be connected to a two-contact outlet.

This instrument operates from 115 or 230 volts ac ±10%, 50 or 60 Hz. Power line frequency should be specified when ordering. If crystal oscillator option (Option B15) is selected, unit may be operated at power line frequencies from 48 to 440 Hz. It draws approximately 7.5 watts. The power supply is factory supplied in the 115 volts configuration. If the instrument is modified for 230 volt operation, it is good practice to conspicuously label the instrument to that effect.

The conversion of 230 volt operation is a relatively simple matter. See Figure 1 Panel Clock Installation/Cover Removal, Figure 2 Tilt-Stand Removal and Installation.

2.4 INSTALLATION

The unit is normally supplied for bench top and tilt stand operation. If panel mounting is desired refer to paragraphs 2.6 and 2.7.

2.5 INITIAL TURN ON

Initial Turn On should be accomplished as soon as possible after receipt of the instrument as part of the Inital electrical inspection. This procedure checks the Model 8210 for any major internal shipping damage.

(1) Connect the instrument to an appropriate ac power source.

(2) Set the power switch to the On position -- display illuminates.

(3) Continue through all the steps of operation described in Chapter 3.

2.6 TILT-STAND REMOVAL

Figure 2 illustrates the procedure used to remove the tilt-stand -- it is only necessary to remove the two tilt-stand retaining screws.

2.7 PANEL CLOCK INSTALLATION/COVER REMOVAL PROCEDURE

This procedure is explained by Figure 1.

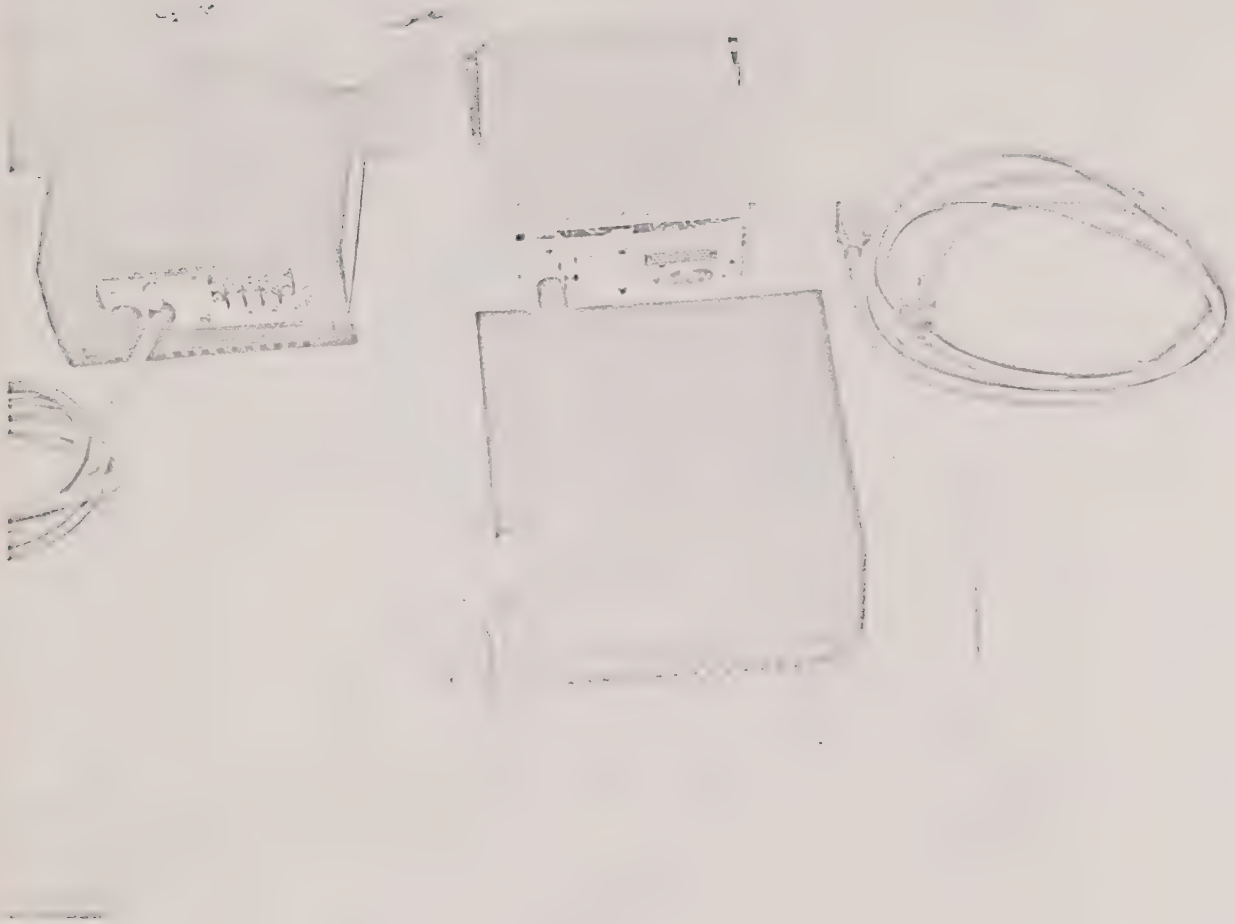


FIGURE I

PANEL CLOCK INSTALLATION/COVER REMOVAL

This figure illustrates the procedure used (a) to remove the case and (b) to convert the Model 8210 to a panel clock. To convert to a panel clock, it is only necessary to remove the two screws that hold the chassis through the panel opening (3.110 inches high x 6.820 inches wide) and re-install the case to the chassis with the two rear panel mounted, case retaining screws.

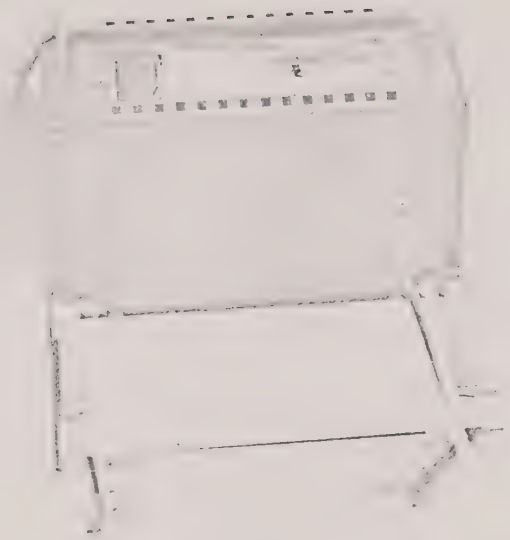


FIGURE 2

TILT STAND REMOVAL

This figure illustrates that removal of the tilt stand requires only that the two honding screws be removed and a gentle pull will separate the chassis from the stand.

CHAPTER 3 OPERATION

(1) ON Switch -- Applies power to the unit when in the ON (up position) and removes power from the system when in the OFF down position.

(2) REMOTE PRESET HOLD RUN Switch - This is the four position Mode select switch which controls the basic mode of operation. Refer to paragraph 3.3.

(3) THUMBWHEEL SWITCHES -- The numbers preselected in the thumbwheel switches will be set into the DISPLAY COUNTERS when in PRESET position of the Mode Select switch and is the time from which the clock begins to count when the Mode Select switch is placed in the RUN position.

(4) TIME COUNT DISPLAY -- The six digit TIME COUNT DISPLAY will continuously display the internally generated time, updating once each second through 23 hours, 59 minutes, and 59 seconds.

3.1 GENERAL

The Model 8210 is ready to operate immediately after turning on the power switch. Preliminary adjustments or calibration procedures are not normally required. It is advisable to read the following description, which describes the use of the controls, connectors, and indicators, before using the unit.

3.2 MAIN POWER ON

The front panel switch labeled ON is the power switch for the unit. In the up or ON position power is applied to the unit. Down is the Off position.

3.3 MODE SELECT

The four position front panel rotary switch, labeled REMOTE PRESET HOLD RUN, controls the four basic modes of the Model 8210.

3.3.1 REMOTE

The REMOTE position allows the clock to be fully controlled (except for energjzing and deenergizing) from an external source. External control allows Preset (to time selected by thumbwheels), Reset (to zero), Hold, and Run.

3.3.2 PRESET

The PRESET position places all counters in a "Stop" condition and permits presetting of the six thumbwheel switches to the desired start 1 time when time-of-day is desired, or setting all six thumbwheels to "0" for some later starting time when elapsed time is to be kept. Mode Select switch swquence must be PRESET to HOLD to RUN for updating to begin from the time set on the THUMBWHEEL SWITCHES.

3.3.3 HOLD

The HOLD position will stop the count in the display register and will allow the latest count to be displayed continuously. When the Mode Select sequence is HOLD to RUN position the updating resumes from the displayed HOLD time.

3.3.4 RUN

This position permits time accumulator to begin at the time selected on the thumbwheel switches provided the switching sequence is from PRESET to HOLD, to RUN. One second after switching to RUN position the clock begins updating.

After the clock has been started remotely no interruption in time will occur when Mode Select switching from REMOTE to RUN to REMOTE unless changes have been made in the settings of the controlling unit while the clock was in the RUN mode of operation.

3.4 THUMBWHEEL SWITCHES

The front panel six digit THUMBWHEEL SWITCHES with colon separations between hours and minutes, and minutes and seconds are for presetting a desired start time into the hours, minutes, and seconds counters and display registers. The time set must be within the capability of the unit, i.e., some time-of-day between 00:00:00 and 23:59:59, with the standard unit, or 00:00:00 and 99:59:59 if W1 internal jumper is removed. If a time greater than the unit capability is set on the THUMBWHEEL SWITCHES only garbled information will ensue on placing the Mode Select switch in RUN position.

When Option A17 is included the THUMBWHEEL SWITCHES are used to set in a coincidence time when the clock is in the RUN MODE. When the time in the dipslay is equal to the time set on the THUMBWHEELS, a pulse output will be provided on one pin of the rear panel multi-pin connector to be used in initiating logging cycles, actuating relays, or controlling external circuitry.

3.5 TIME COUNT DISPLAY

The horizontal in-line array of six ultra long-life cold cathode numerical-display tubes present a display of the continuous (once a second) updating time in hours, minutes, and seconds with colon separation between hours, and minutes, and minutes and seconds.

3.6 EXT 1 PPS J3

This rear panel BNC connector is provided to accept an external 1 pps time base reference signal (Option A14 only) to the unit.

3.7 EXT INT 1 PPS

This rear panel Slide Switch (Option A14 only) provides the means to select either the internal or external 1 pps time base reference for the unit.

3.8 50 PIN CONNECTOR J2

This rear panel 50 pin connector provides pins for all electrical outputs, and REMOTE CONTROL inputs.

3.9 POWER INPUT CONNECTOR J1

This rear panel connector is a POWER INPUT/LINE FILTER type connector. It accepts 117/230 volts $\pm$10%. When ordering either 50 Hz or 60 Hz power line frequency should be specified. When crystal oscillator time base (Option B15) is selected, the unit may be operated at 48 to 440 Hz line frequency.

3.10 FUSE F1

FUSE F1 is shown with 0.25 amp slow blow and labeled for 115 V ac operation. For 230 volt operation F1 should be replaced with a 0.125 amp slow blow fuse and properly labeled.

3.11 OPERATION

The following operation instruction apply equally to either time-of-day or elapsed time operation.

(1) Insure that the instrument has the proper power applied and when Option A14 is included, select either internal or external time base.

(2) Place the Power switch to the ON (up) position.

(3) PLace the Mode Select switch in the PRESET position. Refer to paragraph 3.3.2.

(4) Set the desired starting time on the six THUMBWHEEL SWITCHES. Refer to paragraph 3.4.

(5) At the desired start time set the Mode Select switch to the RUN position. Refer to paragraph 3.3.4. Updating begins one second after the time set on the THUMBWHEEL SWITCHES.

CHAPTER 4 MAINTENANCE

4.1 FACTORY SERVICE

When the instrument requires service, the nearest Systron-Donner representative should be contacted. He can provide field service or arrange for factory returns when necessary. Address all inquiries on operation or applications to your nearest sales representative, or to:

SALES MANAGER, SYSTRON-DONNER CORPORATION
1 Systron Drive
Concord, California 94520

Specify both model and complete serial number in all correspondence.

4.2 ROUTINE MAINTENANCE

A regular program for routine maintenance and inspection every five to six months is recommended for this unit. As part of these regular procedures, the instrument should be checked in the following manner:

(1) Disconnect ac power and remove the instrument cover (Refer to paragraph 2.7).

(2) Make a thorough visual inspection of all wiring and cables. Check for frayed, loose, or burned wires.

(3) Check for physical integrity of all components. Look for burned or cracked components, loose solder connections, leakage of insulation compounds, and general physical damage. When a printed circuit board contains integrated circuit packages, ensure that all packages are firmly mounted. Never unnecessarily

remove and replace a package.

(4) Check all front panel switches and controls for loose or broken terminals, loose or sticking shafts, etc.

(5) If the internal panel surfaces and components have an excessive amount of dust deposited on them, use a soft brush and a low pressure stream of air to remove the foreign material.

(6) Apply power to insure the presence of 225 V dc ±15% and check the adjustment of the +5 V dc ±0.5 V.

CAUTION

Do not clean PC boards or small internal components with a stiff brush or solvents, since damage to the circuits may result. A high-powered vacuum cleaning device should not be used on small internal components.

(7) Wipe the external surfaces of the instrument with a soft damp cloth to remove dirt, fingerprints, and other foreign material.

(8) Replace the instrument cover and reconnect ac power. Perform the normal operating steps cited in paragraph 3.11; and elaborated on in other areas of Chapter 3. If performance does not match or exceed the specifications listed in Chapter 1 of this manual, corrective maintenance is in order.

4.3 PRINTED-CIRCUIT BOARD REPAIR

To remove a part on a printed circuit board, cut the leads of the part near the lead holes. Using a low power (50 watts or less) soldering iron, apply heat sparingly to each cut lead. As soon as

solder melts, slip the lead from the hole and clean the hole with a toothpick. Clean the board surfaces with isopropyl alcohol. Form the tinned leads of the replacement part and insert in cleaned holes, trimming the leads to extend 1/16 inch beyond the back surface of the board. Only 63/37 solder with a maximum diameter of 1/16 inch should be used. Solder the leads to the board and use a hemostat, long-nosed pliers, or other heat sink on the leads of all semiconductor devices and quarter-watt resistors. Allow the soldered junction to cool before removing the heat sink.

CHAPTER 5 OVERALL FUNCTIONAL DESCRIPTION

5.1 GENERAL

The basic 8210 is a counter that is set up to scale seconds, minutes, and hours rather than so many counts per unit of time.

The signal that is being counted is the 60Hz power line frequency. (Options allow for counting other signals). To understand this Functional Description, frequent reference to Dwg. 21810-7-1 is required.

5.2 INPUT

The 60Hz input comes from pin 4 of the filter assembly Dwg. 21974-7-1 and goes to pins 4 and 5 of A32. This signal is amplified by the first sections of A32 to insure a fast rise and fall signal into C1. The output of C1 is inverted by the third sections of A32 and feed to the fourth section where it is gated. This gate is controlled by the flip-flop made up of two sections of A27. This flip-flop is controlled from the MODE switch or remote signals when the MODE switch is in the remote position. The gate is closed when the MODE switch is in the HOLD or PRESET positions.

5.3 FIRST STAGE COUNT CHAIN

The output of this gate (A32) is fed to the count chain. The first stage of the count chain is A31. This stage is special because it changes depending on the rate of the input to pins 4 and 5 of A32.

1) If the rate is 60Hz, A31 is a C2125A chip and is connected to divide by 6 so that the output of A31 is 10Hz.

2) If the rate is 50Hz, A31 is an N8280A and is connected to divide by 5 so that the output of A31 is 10Hz.

3) If the rate is 100Hz from the crystal option card, then, A31 is an N8280A chip and is connected to divide by 10 so that the output is 10Hz.

The different configurations are possible with the jumpers W3, W4, W5 and W6 as shown in NOTE 5 on Dwg. 21810-7-1.

The two sections of A26 that are connected to A31 form a 4 input NOR gate that generate the 10 PPS pulse rate for external control.

5.4 INTERNAL 1 PPS GENERATION

The carry output of A31 (pin 12) goes to the input of the next stage pin 8 of A25. This stage is always set to divide by 10 so that its output is at a 1 PPS rate. The two sections of A26 that are connected to A25 form a four input NOR gate to generate the 1 PPS signal for external use. The carry output of A25 goes to the INTernal, EXTernal switch which selects the 1PPS count chain.

5.5 PRINT COMMAND

The signal from the INT EXT switch goes to pins 4 and 5 of A29.

A29 makes up the circuit that allows the print command to lock out updating the time when it is being transferred to some other equipment. This occurs when the print command is at a 0.0 V level. If an update signal is received while the print command is at 0.0 V it is stored in the flip-flop form by two sections of A29 and when the print command goes back to +5 V the time is updated. Since only one update signal can be stored the maximum time that the print command can be held at 0.0 V without losing time is 800 milliseconds.

5.6 COUNT CHAIN DIVISION

The output of the A29 flip-flop pin 8 goes to rest of the count chain. (A12, A11, A10, A9, A8 and A7). A12, A10, A8 and A7 are all wired to divide by 10. A11 and A9 are wired to divide by 6. A8 and A7 are normally connected to reset at 24, thus, a 24 hour clock. But jumper W1 can be left out and A7 and A8 will count 99, thus, a 100 hour clock. A23 forms two four input NOR gates; one for the 1 PP 10 sec. external signal, and one for the 1 PPM signal. The 1 PPH signal is generated by 2 sections of A28.

The six stages of the count chain that scale the time-of-day (A12, A11, A10, A9, A8 and A7) are connected to associated readout drivers A6, A5, A4, A3, A2 and A1. Also they are connected DTL Buffers (A30, A35, A34, A33, A20 and A19) which supply the BCD parallel output lines at J2.

5.7 DIGIT SWITCHES

To preset the time the digit switches S1 through S6 must be set to the desired time and then the MODE switch set to PRESET. The clock will not start until the MODE switch is set to RUN.

5.8 ALARM CIRCUITS

The alarm circuits are made up of A18, A17, A16, A15, A14 and A13 which are four bit comparators and A24 and A22 which AND the outputs to give a 0.0 volt signal at pin 8 of A22 when the time set in the digit switches compares to the time in the clock. This signal will stay at 0.0 V for one second and then return to +5 V with a 6k ohm source.

CHAPTER 6 PARTS IDENTIFICATION

MODEL 8210 DIGITAL CLOCK

6.1 PARTS LIST

Rear Panel Assembly - Ref. P/L 21766

Ref. Desig.	Description	S/D Part No.	Note
J1	Power Connector/Line Filter	21981-8-1	See P/L 21981
J2	Connector, 50 Pin	J0658	
J3	Connector, BNC	J0165	Option A14 only
F1	Fuse, 0.25 Amp Slow Blow	F0043	
XF1	Fuse Holder	X0034	
S4	Switch, Slide	S0356	Option A14 only
Q1	Transistor, 2N4921	Q0267	
C1	Capacitor, Variable 1-30pfd	C1153	Option B15 only
	Line Cord	W0076	

Main Frame Assembly - Ref. P/L 21771

C8	Capacitor, 2500 ufd, 15 V	C1148	
C10	Capacitor, 10 ufd, 450 V	C0337	
T1	Power Transformer	25294	
	Filter Assembly		See P/L 21974 N/A if Option B15 added
	Xtal Oscillator Assy		See P/L 31061 Option B15 only

Power Connector/Line Filter - Ref. P/L 21981

J1	AC Receptacle, Switchcraft AC3G	J0566	
C1	Capacitor, 0.01 ufd, 1500 V	C0423	
C2	Same as C1		
L1	Hash Filter (J.W. Miller #5250)		
L2	Same as L1		

Ref. Desig.	Description	S/D Part No.	Note
Front Panel Assembly - Ref. P/L 21771			
	Capacitor 2500 ufd	C1148	
	Capacitor, 10 ufd, 450 V	C0337	
S1	Switch, Thumbwheel	S0353	
S2-6	Same as S1		
S7	Switch, Toggle SPDT	S0149	
S8	Switch, Wafer	S0361	
CR1	Diode, IN4151	CR0150	
CR2	Same as CR1	B2133	
Filter Assembly - Ref. P/L 21974-8 (N/A if Option B15 included)			
C1	Capacitor, 1 ufd, 200 V	C0270	

Ref. Desig.	Description	S/D Part No.	Note
C2	Capacitor, 0.1 ufd 200 V	C0382	
C3	Capacitor, 0.33 ufd 100 V	C0767	
C4	Same as C1		
CR1	Diode, IN4151	CR0150	
	Transistor Pad	H0544	
Q1	Transistor, 2N4124	Q0235	
R1	Resistor, 82 k, 1/4 w, 5%	R0784	
R2	Resistor, 27 k, 1/4 w, 5%	R0824	
R3	Resistor, 9.1 k, 1/4 w, 5%	R0776	
R4	Resistor, 4.7 k, 1/4 w, 5%	R0891	

XTAL Oscillator Assembly - Ref. P/L 31061 (Option B15 only)

A1	Integrated Circuit	19711
A2-4	Same as A1	
C1	Capacitor, Variable 9-35 pfd	C0709
C2	Capacitor, 22 pfd, Mica	C0529
C3	Capacitor, 0.05 ufd, Disc	C0672
C4	Capacitor, 68 pfd, Mica	C0635
C5	Capacitor, 0.02 ufd, Disc	C0322
CR1	Diode, In966B	CR0213
CR2	Diode, IN4151	CR0150
Q1	Transistor, TIS-34	Q0244
Q2	Transistor, 2N4124	Q0235
R1	Resistor, 100 k, 1/2 w, 5%	R0352
R2	Resistor, 3.9 k, 1/4 w, 5%	R0939
R3	Resistor, 100 k, 1/4 w, 5%	R0741

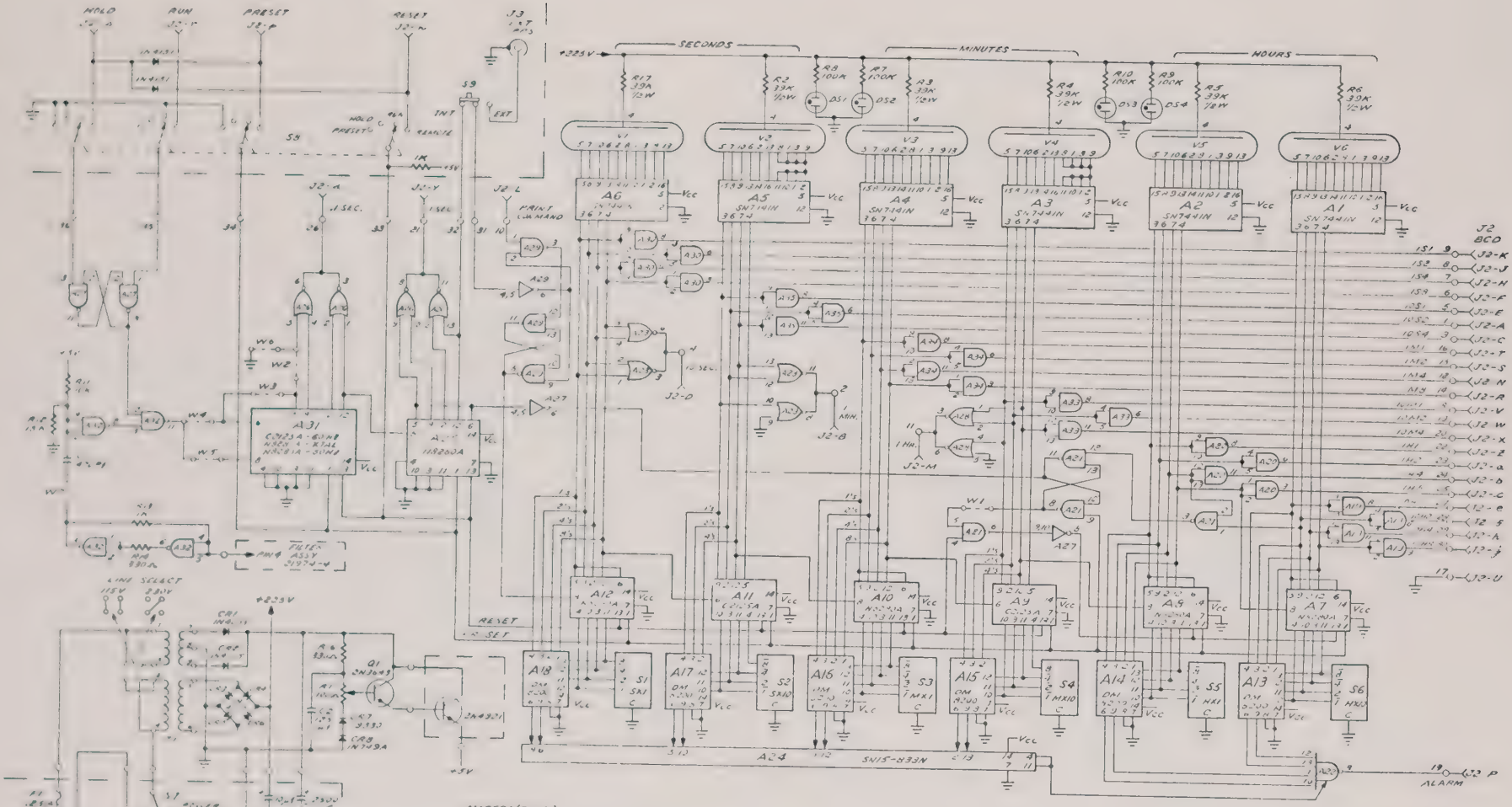
Ref. Design.	Description	S/D Part No.	Note
R4	Resistor, 2.2 k, 1/4 w, 5%	R0749	
R5	Resistor, 6.8 k, 1/4 w, 5%	R0696	
R6	Resistor, 1.2 k, 1/4 w, 5%	R0809	
Y1	Crystal, 1 MHz	Y0019	

Main Logic Board Assembly - Ref. P/L 21810

A1	Integrated Circuit SN7441N	19707	
A2-6	Same as A1		
A7	Integrated Circuit, N8280A	25722	
A8	Same as A7		
A9	Integrated Circuit, C2125A	25723	
A10	Same as A7		
A11	Same as A9		
A12	Same as A7		
A13	Integrated Circuit, DM8200		Option A17 only
A14-18	Same as A13		Option A17 only
A19	Integrated Circuit, MC1806P	25733	
A20	Same as A19		
A21	Integrated Circuit, SN15846N	19716	
A22	Integrated Circuit, SN15830N	19712	Option A17 only
A23	Integrated Circuit, MC1810P	25735	
A24	Integrated Circuit, SN15833N		Option A17 only
A25	Same as A7		
A26	Same as A23		
A27	Same as A21		
A28	Same as A23		
A29	Same as A21		
A30	Same as A19		

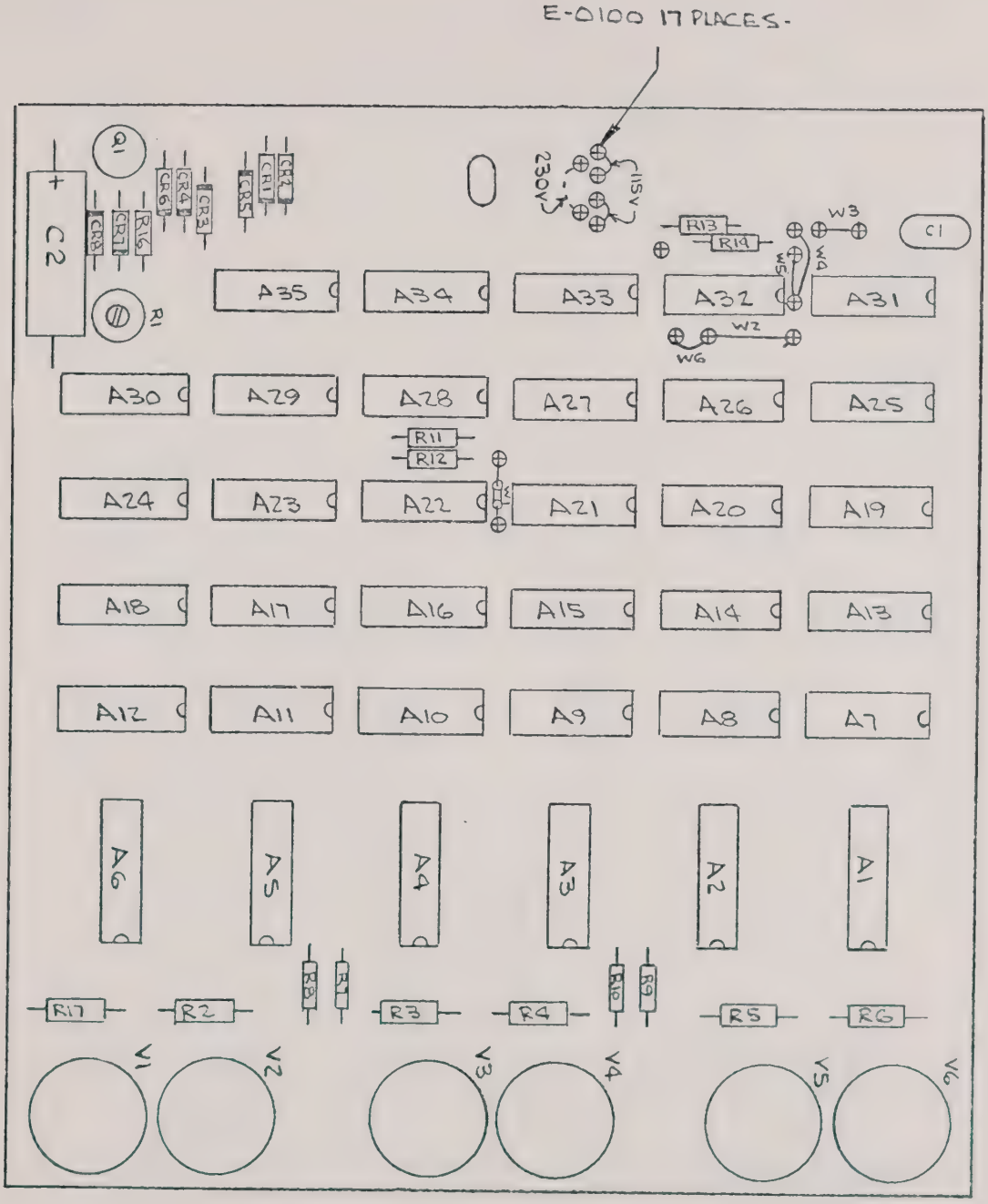
Ref. Desig.	Description	S/D Part No.	Note
A31	Integrated Circuit, C2125A	25723	60 Hz time base
A31	Integrated Circuit, N8280A	25722	50 Hz time base
A31	Integrated Circuit, N8280A	25722	Option B15
A32	Integrated Circuit, SN7400N	19705	
A33-35	Same as A19		
XXX			
C1	Capacitor, 470 pfd	C0542	
C2	Capacitor, 125 ufd	C1147	
CR1	Diode, IN4005	CR0284	
CR2-6	Same as CR1		
CR7	Diode, IN749A	CR0306	
CR8	Diode, Spec.	19330	
R1	Resistor, Variable 100 ohm	R2374	
R2	Resistor, 39k, 1/2 w, 5%	R0282	
R3-6	Same as R2		
R7	Resistor, 100 k, 1/4 w, 5%	R0741	
R8-10	Same as R7		
R11	Resistor, 10 k, 1/4w, 5%	R0766	
R12	Resistor, 15 k, 1/4 w, 5%	R0728	
R13	Resistor, 1 k, 1/4w, 5%	R0706	
R14	Resistor, 330 ohm, 1/4w, 5%	R0662	
R15	N/A		
R16	Same as R14		
R17	Same as R2		
	Socket IC Augat 314-AG5D-2		
Q1	Transistor, 2N3643	Q0179	
V1	Readout Tube, (NL904)	V0125	
V2-6	Same as V1		

Ref. Desig.	Description	S/D Part No.	Note
W1	Jumper, Insulated		Delete for 99hr. full scale
W2	Jumper, Insulated		Option B15 only
W3	Jumper, Insulated		Option B15 only
W4	Jumper, Insulated		Delete for Option B15
W5	Jumper, Insualted		Option B15 only
W6	Jumper, Insulated		Delete for Option B15



SCHEMATIC
MODEL 8210
DIGITAL CLOCK

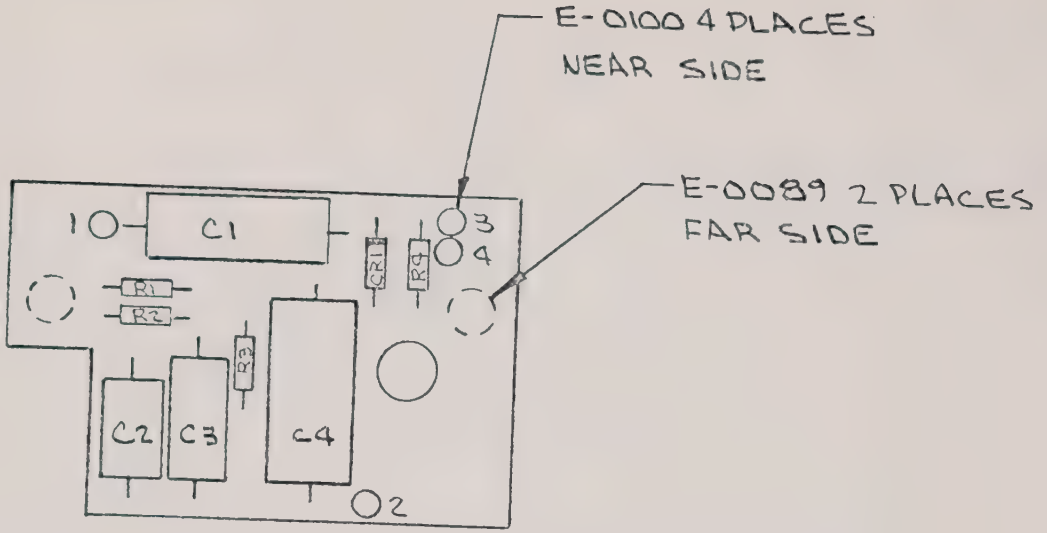
21810-7-1



ASSEMBLY
CLOCK
LOGIC

21810-4-1

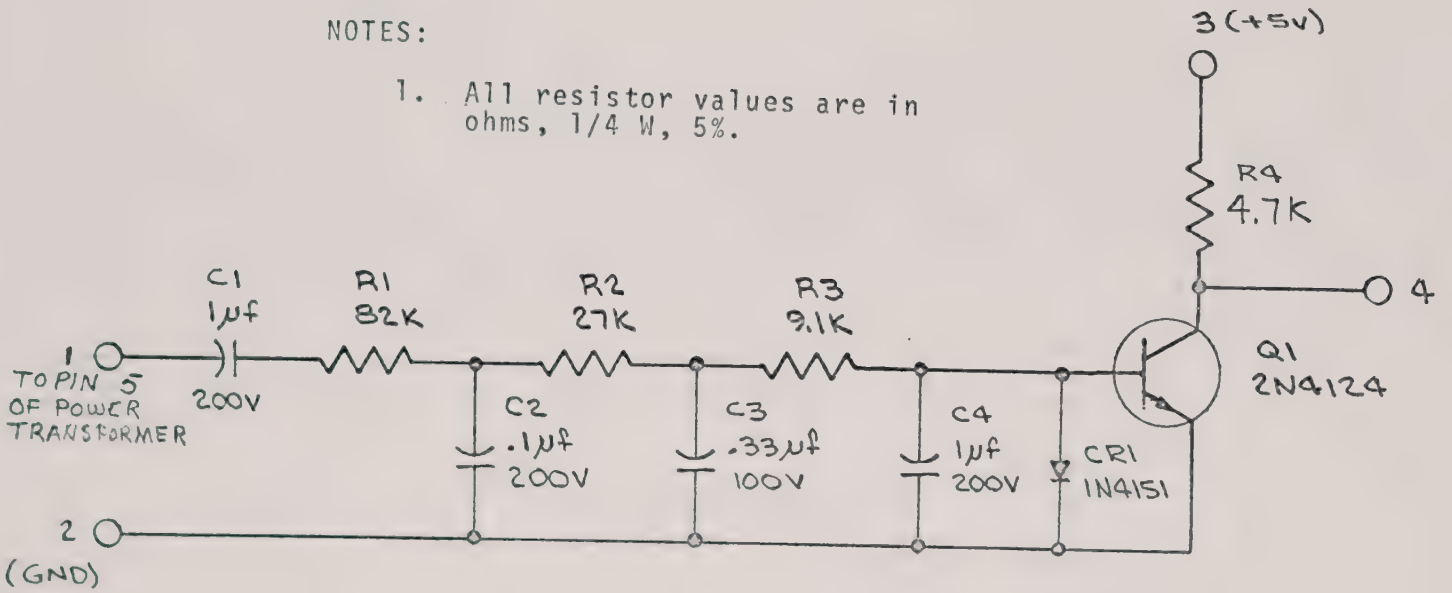
ASSEMBLY
FILTER
21974-4-1

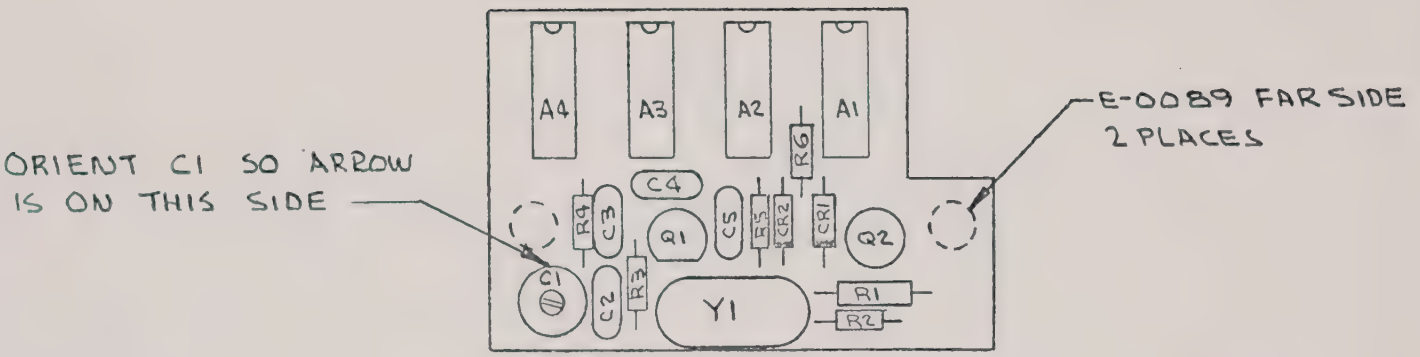


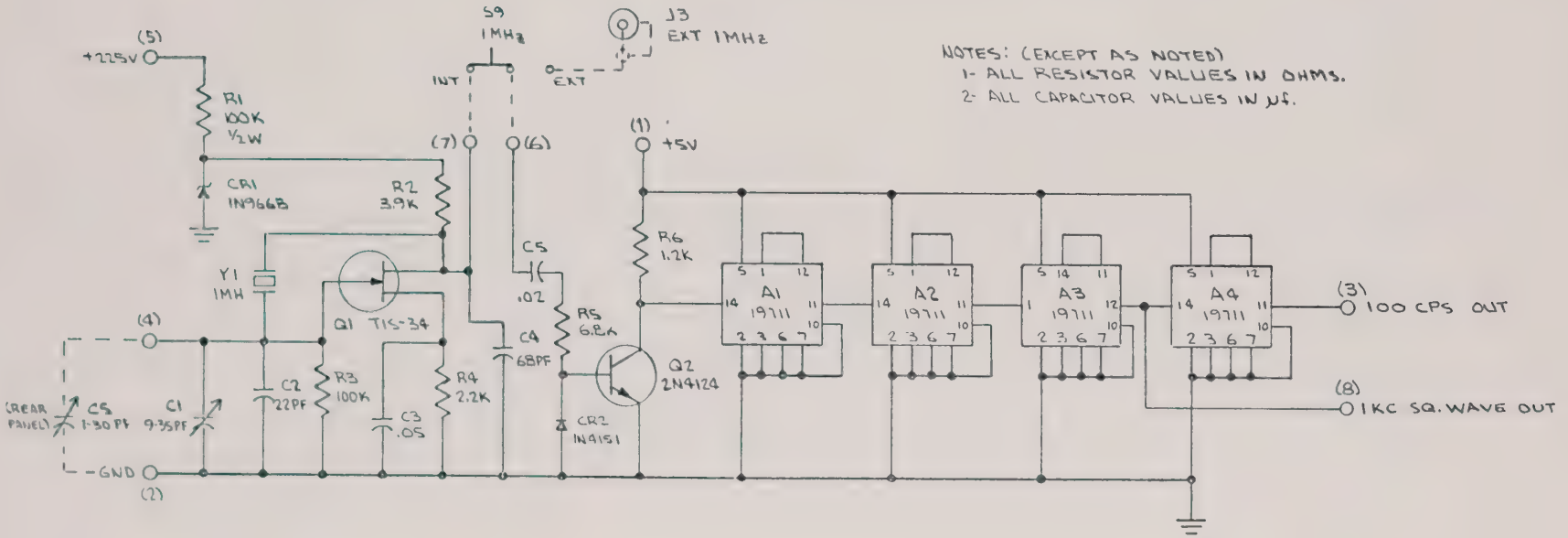
NOTES:

1. All resistor values are in ohms, 1/4 W, 5%.

SCHEMATIC
FILTER
21974-7-1

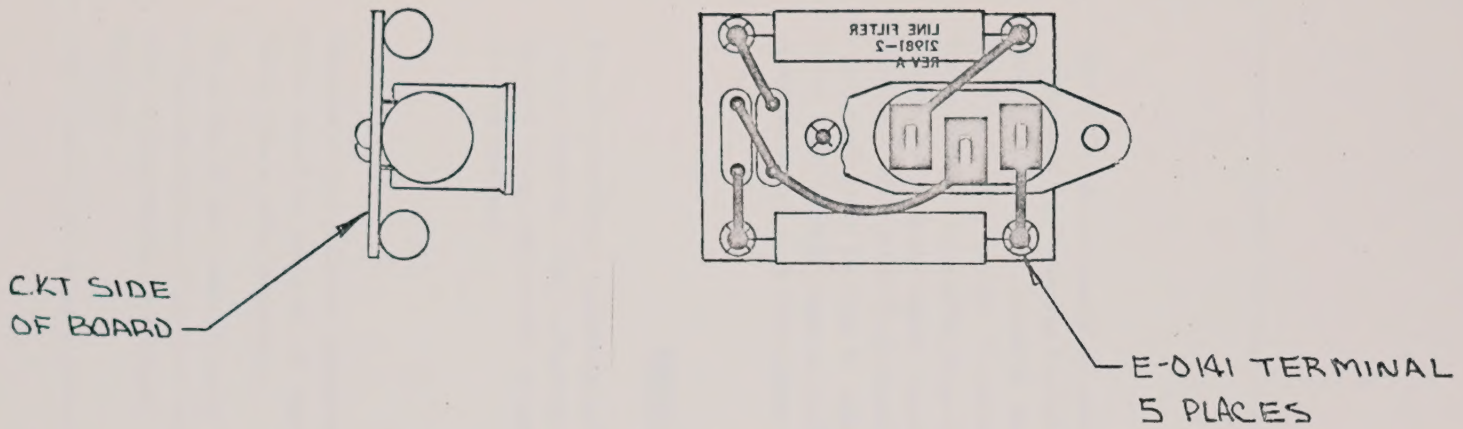






NOTES: (EXCEPT AS NOTED)
1- ALL RESISTOR VALUES IN OHMS.
2- ALL CAPACITOR VALUES IN μf.

SCHEMATIC 31061-7-1
ASSEMBLY 31061-4-1
X-TAL OSC
(OPTION B-15)



ASSEMBLY NOTES:

1. Component lead terminations to be per MIL-Std-275A, Type B.
2. All parts shall be mounted so that the body of the component is as close as practicable to the printed wiring board.
3. Solder to be Composition Sn60 or Sn63, type S or AR, per Spec. QQ-S-571.
4. Soldering flux shall conform to specification MIL-F-14256.
5. This area of the connector tabs to be free of any solder.
6. Assembled boards shall be clean and free from dirt, oil, corrosion, corrosion products, salts, smut, grease, fingerprints and all foreign matter.

ASSEMBLY
LINE
FILTER

21981-4-1

WARRANTY

Systron-Donner instruments are warranted during a period of one year from date of shipment to original purchaser to be free from defects in material and workmanship. This warranty does not apply to vacuum tubes, except as they are warranted by tube manufacturers. The liability of Seller under this warranty is limited to replacing or repairing any instrument or component thereof which is returned by Buyer at his expense during such period and which has not been subjected to misuse, neglect, improper installations, repair, alteration, or accident. Seller shall have the right of final determination as to the existence and cause of a defect. In no event shall Seller be liable for collateral or consequential damages. This warranty is in lieu of any other warranty, express, implied or statutory, and no agreement extending or modifying it will be binding upon Seller unless in writing and signed by a duly authorized officer.

RECEIVING INSPECTION

Every Systron Donner instrument is carefully inspected and is in perfect working order at the time of shipment. Each instrument should be checked as soon as received. If the unit is damaged in any way or fails to operate, a claim should immediately be filed with the transportation company.

REPAIRS

Whenever a Systron-Donner instrument requires service, the nearest Systron-Donner representative should be contacted; all representatives will provide immediate service or arrange factory returns when necessary.

Please specify both model and serial number in all correspondence concerning Systron-Donner instruments. Address all inquiries on operation or applications to your nearest sales representative or Sales Manager, Instruments, Systron-Donner Corporation, 888 Galindo Street, Concord, California.